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Ernest A. Beutler
Reg. No. 19901

In re Application of
Chihiro, Araki

App. No.:	10/063870
Filed:	May 21, 2002
Conf. No.:	2472
Title:	WIRE BONDING METHOD AND APPARATUS THEREFOR
Examiner:	L. Tran
Art Unit:	1725

APPELLANT'S BRIEF

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TC 1700
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Commissioner for Patents
P.O. Box 1450
Arlington, VA 22313-1450

Dear Sir:

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences the outcome of which or which would be affected by the decision on this appeal.

REAL PARTY IN INTEREST

The real party in interest, in addition to the inventor, is his assignee, Kabushiki Kaisha Moric a Japanese company.

STATUS OF THE CLAIMS

Claims 1 through 14 remain in this case and a clean copy of these claims appears in the Appendix to this brief.

STATUS OF AMENDMENTS

A Request for Reconsideration was filed in response to the Final Rejection, but no amendment to the claims was proposed. Thus the claims before the Board are in the form as finally rejected.

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APPELLANT'S INVENTION

Appellant's invention relates to a wire bonding method and apparatus and more particularly to a method and apparatus for bonding wire leads to a semiconductor device. More particularly the method and apparatus are directed to improvements in a known process that utilizes an ultrasonic type wire bonder. This employs applying an ultrasonic vibration to the bonding tool. The wire is bonded by pressing both it and the tool against the chip bonding pad. In the presently utilized apparatus and methods the duration of welding time is preset. The preset time is determined by taking account of the bonding characteristic of the bonding section to assure maximum dispersion of the wire and adding a certain time margin for safety.

Appellant has discovered that when a metallic wire is actually welded the length of time required for completion of bonding can vary from the preset time depending on dispersion of the welding characteristic of the individual pad. Thus even though a good bond may have already been established, the bonding operation continues until the preset time has elapsed. Therefore, unnecessary vibration and pressing force is exerted on the semiconductor chip, causing cracking or breakage, and deterioration of the internal function.

Therefore in accordance with the invention, the degree of bonding is constantly monitored during the welding period and when a good bond has been established the welding operation is totally stopped. The time of stoppage may be either before or after the preset times previously employed. There are several innovative ways of determining the degree of bonding disclosed.

The detailed description and reference to the application drawings appears under the appropriate heading in the specification of the application.

ISSUE BEFORE THE BOARD

The sole issue before the board is whether the substance of each of the claims on appeal is anticipated under 35 USC 102(b) by Okamura 5,433,369 (Okamura)

GROUPING OF THE CLAIMS

The following groups of claims stand or fall together:

Claims 1, 4 and 12

Claims 6 and 13

Claims 9 and 14.

The patentability of these groups and the remaining claims are argued separately.

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APPELLANT'S ARGUMENT

Since the sole ground of rejection is anticipation, the Board need merely look to the claim language and compare it with the Okamura disclosure. If the claims read on Okamura, the rejection should be sustained. If not, it should be reversed. However before moving to the claims per se, appellant would like to point out that although Okamura like appellant is concerned with improving ultrasonic wire bonding he is concerned with an entirely different facet of the process than that dealt with by appellant. Okamura, to use his own wording, "makes it possible to monitor the power supply to a joint and perform feed back control so that the power supply is kept constant". (see column 4, lines 37-39) Nowhere in his disclosure is any description or objects any reference to the welding time. Of course this is the area of appellant's invention and claims. Thus not only does the reference fail to deal with the problem solved by appellant, he does not even mention this phase of the welding process.

Turning now specifically to the claim language, independent claim 1 states, "detecting the degree of bonding between the metallic wire and the device, and stopping the application of ultrasonic vibration and pressure in response to the detection of completion of the state of bonding". Thus a detection of the degree of bonding is required. Okamura never mentions let alone determines the degree of bonding. He detects "a decrease in power supply due to the contact between the bonding wire and the electrode". (See claim 1, column 4 lines 53-55) This is in no way known in the art related to the degree of bonding.

In addition to this significant distinction, claim 1 further calls for "stopping the application of ultrasonic vibration and pressure in response to the detection of completion of the state of bonding". As stressed above, Okamura fails to mention anything about tie time the welding operation is stopped. He apparently practices the known prior art of using a preset welding time and strives to better control the electrical power application to achieve a good weld.

Claim 2 depends on claim 1 and further calls out that the article welded comprises "a semiconductor chip and the metallic wire is welded to a bonding pad on the semiconductor chip". Okamura does not tell us what is being welded other than a wire and thus can not anticipate this claim under 35 USC 102.

Claim 3 still further defines the welded article in calling for "the semiconductor chip is mounted on a substrate when the metallic wire is welded". Again there is not the requisite anticipation for the reason noted above.

Claim 4 depends on claim 1 and defines the oscillator. This claim stands or falls with claim 1.

Claim 5 depends on claim 4 and further defines that the "state of bonding is determined by a feedback signal from the oscillator". Okamura monitors a feedback signal, but not one from the

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oscillator because he is monitoring current because that is what he is controlling not the degree of bonding. Appellant has discovered that degree of welding can be determined by a feedback signal from the oscillator. An invention not taught or even contemplated in Okamura.

Claim 6 depends on claim 5 and further describes how the oscillator feedback determines the state of bonding by "an abrupt change of the waveform of the feedback signal". As noted above, Okamura never even enters this territory.

Claims 7 and 8 depend on claim 6 and add the further distinctions mentioned above in the discussion of claims 2 and 3. These claims however do not stand or fall together because of their different dependency.

Claim 9 like claim 6 depends on claim 5, but claims another way in which the degree of bonding can be determined. This is when there is "a lack of significant change in the waveform of the feedback signal". Again this is far beyond Okamura's disclosure.

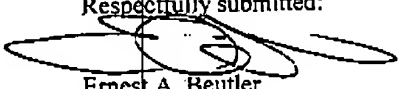
Claims 10 and 11 depend on claim 9 and add the further distinctions mentioned above in the discussion of claims 2 and 3 and 7 and 8. These claims however do not stand or fall together because of their different dependency.

Claim 12 is an independent apparatus claim that claims the apparatus for performing the method of claim 1. This claim stands or falls with claim1.

Claims 13 and 14 depend on claim 12 and further recite the apparatus for carrying out the methods of claims 6 and 9, respectively and thus stand or fall with the respective method claims.

Therefore it is most respectfully submitted that the Examiner has totally failed in making out a prima facia case of anticipation and the Board is respectfully requested to reverse his rejections.

Respectfully submitted:



Ernest A. Beutler
Reg. No. 19901

Phone (949) 717- 4821
Pacific Time

OFFICIAL

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APPENDIX
CLEAN COPY OF CLAIMS ON APPEAL

1. A wire bonding method for pressure welding a metallic wire to device while applying ultrasonic vibration, said method comprising the steps of applying pressure between the metallic wire and the device and simultaneously applying a vibratory force thereto, detecting the degree of bonding between the metallic wire and the device, and stopping the application of ultrasonic vibration and pressure in response to the detection of completion of the state of bonding.

2. A wire bonding method as set forth in claim 1 wherein the device comprises a semiconductor chip and the metallic wire is welded to a bonding pad on the semiconductor chip.

3. A wire bonding method as set forth in claim 2 wherein the semiconductor chip is mounted on a substrate when the metallic wire is welded.

4. A wire bonding method as set forth in claim1 wherein the ultrasonic vibration is created by an oscillator.

5. A wire bonding method as set forth in claim 4 wherein the state of bonding is determined by a feedback signal from the oscillator.

6. A wire bonding method as set forth in claim 5 wherein the completion of bonding is determined from an abrupt change of the waveform of the feedback signal.

7. A wire bonding method as set forth in claim 6 wherein the device comprises a semiconductor chip and the metallic wire is welded to a bonding pad on the semiconductor chip.

8. A wire bonding method as set forth in claim 7 wherein the semiconductor chip is mounted on a substrate when the metallic wire is welded.

9. A wire bonding method as set forth in claim 5 wherein the completion of bonding is determined from a lack of significant change in the waveform of the feedback signal.

10. A wire bonding method as set forth in claim 9 wherein the device comprises a semiconductor chip and the metallic wire is welded to a bonding pad on the semiconductor chip.

11. A wire bonding method as set forth in claim 10 wherein the semiconductor chip is mounted on a substrate when the metallic wire is welded.

12. A wire bonding apparatus having a tool for holding a metallic wire to press it against a device, a vibrator for applying ultrasonic vibration to said tool, an oscillator for powering said vibrator, a control section for controlling output of said oscillator, a pressing device for applying pressing force to said tool, a bonding detector that detects the degree of bonding of the metallic wire to the device to advise said control section when to terminate welding.

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13. A wire bonding apparatus as set forth in claim 12 wherein the bonding detector detects the completion of welding by sensing an abrupt change of the waveform of a feedback signal from the oscillator.

14. A wire bonding apparatus as set forth in claim 12 wherein the bonding detector detects the completion of welding by sensing a lack of significant change of the waveform of a feedback signal from the oscillator.

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